



Europäisches Patentamt
European Patent Office
Office européen des brevets

Publication number:

0 363 281
A2

12

EUROPEAN PATENT APPLICATION

21 Application number: 89402742.4

51 Int. Cl. 5: G02C 13/00

22 Date of filing: 04.10.89

30 Priority: 05.10.88 JP 251436/88
24.01.89 JP 14356/89

43 Date of publication of application:
11.04.90 Bulletin 90/15

94 Designated Contracting States:
DE FR GB NL

71 Applicant: Kabushiki Kaisha TOPCON
75-1, Hasunuma-cho Itabashi-ku
Tokyo(JP)

72 Inventor: Ishihara, Taketoshi c/o Kabusiki
Kaisha TOPCON
75-1 Hasunuma-cho Itabashi-ku
Tokyo(JP)

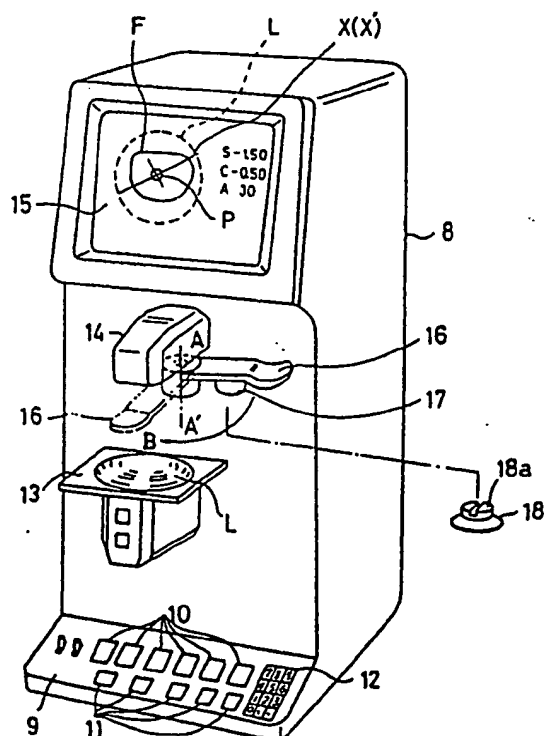
74 Representative: Mongrédien, André et al
c/o SOCIETE DE PROTECTION DES
INVENTIONS 25, rue de Ponthieu
F-75008 Paris(FR)

54 Lens meter.

57 A lens meter has means for measuring the optical characteristics of a lens to be processed, means for inputting information of the outer periphery of the lens, means for inputting information of spectacle frame, and means for composite displaying the optical characteristics, the information of the outer periphery of the lens, and the information of the frame configuration.

Therefore, the "YES" or "NO" judgment for processing the lens can be performed with ease and with correctness irrespective of the provision of a lens plate.

FIG. 1



LENS METER

BACKGROUND OF THE INVENTION

Field of the Invention:

This invention relates to a lens meter capable of measuring optical characteristics of a lens to be machined or processed, making a "YES" or "NO" judgment for processing the lens in accordance with a lens processing data and mounting a processing jig to the lens.

Description of the Prior Art:

In general, when spectacles are made, refractivity, astigmatism axis, etc. of the client's eye are measured first and then a prescription data is prepared based on this measurement. In the meantime, the client is given a chance to select his favorite lens frame, the kind of lenses, etc. and such obtained information is sent to a machining or processing factory or the like. In the processing factory, a lens to be process is selected based on the above-mentioned information and the orientation of the astigmatism axis of such selected lens, optical center (optical axis), etc. are measured by a lens meter. At the same time, a marking is applied to the lens based on the above-mentioned measurement so that when the processed lens is put into the lens frame, the astigmatism axis would be oriented in a predetermined direction.

Next, a lens mold (template) is put on the lens to align the optical axes, the orientation of the astigmatism axis, etc. thereof in order to confirm whether the peripheral edge of the lens mold comes out of the peripheral edge of the lens, that is, whether the basis material will become short. In other words, the "YES" or "NO" judgment for performing the processing work is confirmed (hereinafter referred to as the "processing "yes" or "no" confirmation work"). There are two types for performing this processing "yes" or "no" confirmation work, one is of a direct sight type in which a direct visual confirmation is performed and the other is of a projection type.

And, in this confirmation work, since the processing is not possible when the peripheral edge of the lens mold comes out of the peripheral edge of the lens, it is required to exchange the lens with another lens having a larger diameter. On the other hand, as the lens can be processed when the peripheral edge of the lens does not come out of the peripheral edge of the lens, a suction plate as a

processing jig is mounted on the lens, and this suction plate is mounted on a lens holding shaft of a lens grinder.

By the way, as the application of the marking to the lens and the mounting of the jig on the lens were effected by separate devices, there was such a problem as that errors were occurred in alignment of the axes when the jig was mounted on the lens.

Also, there was such a problem as that when the processing "yes" or "no" confirmation work is performed for a lens having a strong astigmatism in accordance with the projection type, axial errors were likely to occur in a projection image of the marking.

Furthermore, there was such a problem as that in accordance with the direct sight type, parallax is likely to occur to jeopardize a correct observation.

In addition, in recent years, there was developed a lens grinder in which when the lens (ophthalmic lens) is grind processed into the configuration of a spectacle frame, the lens plate (mold plate) is not used and data of the configuration of the lens to be processed is memorized in CPU, etc. beforehand so that the lens is moved upward and downward with respect to a grinding wheel based on the memorized data. As no lens plate is used when the lens is grind processed, the processing "yes" or "no" confirmation work for confirming whether the lens will become short in basis material cannot be performed using the lens plate after the optical characteristics of the lens is measured by the lens meter as mentioned. Therefore, this processing "yes" or "no" confirmation work was difficult to carry out.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a lens meter capable of making a "YES" or "NO" judgment for processing a lens to be processed and mounting the jig on the lens with ease and with correctness irrespective of the provision of a lens plate.

In order to achieve this object, a lens meter of the present invention includes means for measuring the optical characteristics of a lens to be processed, means for inputting information of the outer periphery of the lens, means for inputting information of spectacle frame, and means for composite displaying the optical characteristics, the information of the outer periphery of the lens, and the information of the frame configuration.

Also, the lens meter of the present invention

includes means for measuring the optical characteristics of the center of the external configuration of the lens, means for inputting the diameter of the lens, means for inputting information of the configuration of the frame for the spectacles, means for inputting distances between the centers of lense frams of the spectacles, and between the pupils of the person wearing the spectacles, or a differences in distances between the centers of lense frames of the spectacles and between the pupils, arithmetic means for calculating the position of the optical center from the prism quantity in the center of the external configuration of the lens measured by the measuring means, and means for composite displaying the lens frame of the spectacles and the eye point position of the person wearing the spectacles obtained by the frame configuration information input ins and the distance input means and the information of the outer periphery of the lens when the eye point position and the optical center are brought to be coincident with each other on the same screen.

Also, the lens meter of the present invention includes means for inputting eye inspection data, and the display means is adapted to composite displaying the astigmatism axis of the eye inspection data on the eye point position.

Also, the lens meter of the present invention includes processed in accordance with the lens frame of the spectacles and the eye point position of the person wearing the spectacles and the information of the outer periphery of the lens, and means for displaying the result of the judgment.

Also, the lens meter of the present invention includes means for measuring the optical characteristics of the lens, and means for mounting the jig on the lens held on a lens holding portion of the measuring means.

Also, the lens meter of the present invention includes means for inputting lens data properly treated in accordance with the eye inspection, arithmetic means for comparing the data input by the lens data means with the result of the measurement obtained by means for measuring the optical characteristic of the lens in order to find whether they are coincident with each other, and means for displaying the result of the judgment made by the arithmetic means.

Also, the lens meter of the present invention includes means for inputting information of the frame configuration of the spectacles, means for inputting the distance between the centers of the lens frames of the spectacles and the distance between the pupils of the person wearing the spectacles, or a difference between the distance between the centers of the lens frames and the distance between the pupils, means for measuring the optical characteristics of the lens, means for

displaying the optical characteristics and information of the frame configuration, a first observation optical path for observing the display surface of the display means, and a second observation optical path for observing the external configuration and the outer surface of the lens, and said first and second observation optical paths include a common optical path for simultaneously visually confirming the display on the display surface and the lens which are placed one upon the other.

Also, the lens meter of the present invention includes an input device for inputting the prescription data, and the display surface of the display means is set to display the orientation of the astigmatism axis from the data input by the input device.

Also, the lens meter of the present invention includes means for issuing a warning when there is a difference between the refractive power of the prescription data input and the refractive power of the lens measured.

These and other objects, features and advantages of the present invention will be well appreciated upon reading of the following description of the invention when taken in conjunction with the attached drawings with understanding that some modifications, variations and changes of the same could be made by the skilled person in the art to which the invention pertains without departing from the spirit of the invention or the scope of claims appended hereto.

BRIEF DESCRIPTION OF THE ATTACHED DRAWINGS

Fig. 1 is a perspective view showing a first embodiment of a lens meter according to the present invention.

Fig. 2 is a circuit diagram showing a connecting relation between a control circuit in the lens meter of Fig. 1 and other equipment.

Fig. 3 is an explanatory view showing a relation between the lens meter of Fig. 1 and other equipment.

Fig. 4 is an explanatory view of a frame PD of a spectacle frame.

Fig. 5 is an explanatory view of an pupil PD of the person wearing the spectacles.

Fig. 6 is an explanatory view showing a relation between a lens frame, and an appointment and an astigmatism axis.

Fig. 7 is an explanatory view showing a relation between the optical center of the lens and a cylindrical axis.

Fig. 8 is an explanatory view showing a relation between the lens and the lens frame of the spectacle frame.

Fig. 9 is a perspective view of an adapter for a lens platform which is used in the present invention.

Fig. 10 is a sectional view taken along line VIII-VIII of Fig. 9.

Fig. 11 is a perspective view showing a second embodiment of a lens meter according to the present invention.

Fig. 12 is an optical path of the lens meter of Fig. 11.

Fig. 13 is an explanatory view showing a projecting image.

Fig. 14 is an explanatory view showing the lens frame, etc. displayed.

Fig. 15 is an explanatory view showing the orientation of the astigmatism displayed.

Fig. 16 is an explanatory view showing the lens (double focus lens).

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention will be described hereunder with reference to the drawings.

[First Embodiment]

Figs. 1 through 10 show the first embodiment.

In Figs. 1 and 3, the numeral 1 denotes a lens meter of the present invention. Similarly, in Fig. 3, the numeral 2 denotes an IC card data record reproducing apparatus comprising an IC card reader 2a and an IC read writer 2b of Fig. 2, 3 an objective ophthalmoscopic device, 4a subjective ophthalmoscopic device, 5 a computer for controlling clients, 6 a lens grinder for processing the configuration of a lens L to be processed, and 7 a frame reader for measuring the configuration of a lens frame of the spectacle frame, the distance between the lens frames, the frame PD, etc. The lens meter 1, the data record reproducing apparatus 2, the objective ophthalmoscopic device 3, the subjective ophthalmoscopic device 4, the clients controlling computer 5, the lens grinder 6, etc. are designed as such that they can transmit information with one another.

A body 8 of the lens meter of Fig. 3 is provided on a lower portion of its front surface with a key board 9 as shown in Fig. 1. This key board 9 includes a plurality of operation switches 10 which are used when the optical characteristics of the lens are measured, a plurality of switches 11 for setting data input modes, and ten keys 12 for inputting numeric values as data. Also, the body 8 is provided on the center of its front surface with a lens platform 13 containing therein a measuring portion 13a (measuring means) of Fig. 2 for mea-

suring the lens configuration.

A lens platform adapter A as shown in Figs. 9 and 10 can be mounted on this lens platform 13. The adapter A has a bowl-shaped recess portion a formed in its center, and the recess portion a has a tiny hole b formed in its center. And when the adapter A is mounted on the lens platform 13 for use, the center of the recess portion a, that is, the center Ob of the tiny hole b is brought to be coincident with the center of the measuring portion 13a. In this state, the lens L is mounted in the recess portion a and by measuring the optical characteristics in the center of the external configuration of the processing lens L, the optical center can be calculated by arithmetic means as will be described with reference to the prism quantity. In accordance with this, it can also cope with the lens the optical center of which is displaced from the center of its external configuration.

Also, above the lens platform 13, a mounting projection portion 14 integral with the body 8 is disposed. This mounting projection portion 14 is provided with a lens presser and marking means (not shown). A monitor TV 15 (display means) is disposed on an upper portion of the body 8.

The mounting projection portion 14 is provided on its lower portion with a suction plate mounting lever 16 as a jig mounting means in such manner as to be horizontally pivotable about the axial line A-A' and drivable in the vertical direction. Although the pivoting operation and the vertical driving operation of this suction plate mounting lever 16 are effected by hand in this embodiment, they may be effected automatically. This suction plate mounting lever 16 is provided on its intermediate portion with a suction plate holder 17, and a mounting shaft portion 18a of a rubber suction plate 18 as a processing jig is removably held by this suction plate holder 17.

The body 8 is provided therein with a control circuit 19 as shown in Fig. 2. This control circuit 19 includes an arithmetic control portion 20, a data input portion 21, and a data storing memory 22.

This data input portion 21 comprises a lens diameter input portion 21a (outer periphery information input means of the processing lens L), a frame PD input portion 21b, a pupil PD input portion 21c, a lens data input portion 21d (lens data input means), a displaced amount input portion 21e, etc. Moreover, this data input portion 21 is selected by a mode setting switch 11 as shown in Fig. 1 to input the lens diameter, the frame PD, the pupil PD, the lens data, the displaced amount (moving amount in order to exhibit the prism function), etc. into the arithmetic control portion 20 (arithmetic means). The frame PD input portion 21b and the pupil PD input portion 21c constitute the eye point input means. Also, the frame PD, as

shown in Fig. 4, is adapted to show the distance between the centers of the lens frames in two lens frames (framework) F of the spectacle frames MF, that is, the distance d1 between the geometric centers), while the pupil PD, as shown in Fig. 5, is adapted to show the distance between the centers of the pupils in both eyes of the person wearing the spectacles.

In this embodiment, the lens diameter input portion 21a inputs the diameter of the lens through the ten keys 12 on the key board 9. However, if it is designed such that when the lens L is mounted on the lens platform 13, the lens L is automatically measured by the measuring portion 13a, data of a modified lens other than a circular lens can also be input.

Also, the pupil PD input portion 21c and the lens data input portion 21d are designed as such that data are directly input therein from the objective ophthalmoscopic device 3 and the subjective ophthalmoscopic device 4 through on-line, IC card or the like. However, when data are not directly input into the pupil input portion 21c and the lens data input portion 21d from the objective ophthalmoscopic device 3 and the subjective ophthalmoscopic device 4, necessary data are input by means of operation of the mode setting switch 11 and operation of the ten keys 12 on the key board 9 while looking at the prescription, etc. obtained as the result of the measurement by the objective ophthalmoscopic device 3 and the subjective ophthalmoscopic device 4.

Frame configuration data and lens data are input into the arithmetic control portion 20 from the IC card reader 2a of the IC card data record reproducing apparatus 2. Also, a measuring signal is input into the arithmetic control portion 20 from the measuring portion (sensor) 13a disposed on the lens platform 13. The data of the configuration (frame configuration) of the lens frame of the spectacle frame, the distance between the two lens frames or frames PD (distance between the centers of the lens frames), etc. measured by the frame reader 1, and the lens data such as the most suitable trial lens, etc. used at the eye testing by the objective ophthalmoscopic device 3 and the subjective ophthalmoscopic device 4 are input into the IC card reader 2a as the frame configuration information input means of the spectacle frame. In a case that the frame PD can be measured by the frame reader 7, the frame PD is input into the arithmetic control portion 20 through the IC card reader 2a but in a case that the frame PD cannot be measured by the frame reader 7, the frame PD is input from the frame PD input portion 21b by the ten keys 9.

In this embodiment, the lens data which are input into the arithmetic control portion 20 by the

card reader 2a or the on-line include the refractive power, the cylindrical power, the axial angle, the displaced amount, the pupil PD (distance between the pupils), etc. of a lens prescribed by the eye inspection.

On the other hand, from the arithmetic control portion 20, the processed data including the data of the configuration of the framework are input into the IC read writer 2b, and the data and the configuration of the lens L, the lens frame, etc. are input into the monitor TV 15 so that they are displayed thereon. This IC read writer 2b inputs data necessary for the grind processing control with respect to the peripheral edge portion of the lens L. Also, the arithmetic control portion 20 drive controls a buzzer 23.

This arithmetic control portion 20 calculates the position of the eye point P (see Fig. 6) in the framework F from the frame PD and pupil PD. And this eye point P and the optical center O of the lens L are brought to be coincident with each other, and the arithmetic control portion 20 calculates whether shortage of the basis material is occurred with respect to the spectacle frame MF (Fig. 3) selected. At this time, the framework F and the lens L are displayed in their overlapped state on the monitor TV 16 so that the shortage of the basis material of the lens can be visually observe. Also, the eye point P of the prescription shown in Fig. 6 and the optical center O of the lens L shown in Fig. 7 are brought to be coincident with each other as shown in Fig. 8 and the astigmatism axis X of the prescription shown in Fig. 6 and the cylindrical axis X' of the lens L shown in Fig. 7 are brought to be coincident with each other as shown in Fig. 8 and displayed in that state.

And when the shortage of the basis material has occurred as the result of the calculation, a message to that effect is displayed on the screen of the TV monitor 15 and an alarm display is also performed by the buzzer 23.

Next, as the result of the calculation, when the shortage of the basis material of the lens L is not occurred, the lens L is mounted on the lens platform 13 and the optical characteristics of the optical center of the lens L are measured. And such measured value is compared with the spherical power and cylindrical power of the lens data already input. If they are found to be different as the result of the comparison, a message to that effect is displayed on the screen of the monitor TV 15 and an alarm display is also made by the buzzer 23. It may be designed such that the lens data are not input into the lens meter and the lens data are compared with the result of the measurement in order to make a "YES" or "NO" judgment for processing the lens.

Furthermore, if the optical characteristics of

this lens L are also in accord with the prescription, the frame work F, the eye point P, the astigmatism axis X of the prescription and the optical center O of the lens L, cylindrical axis L which are fixedly displayed on the screen of the monitor TV 15 on the lens platform 13 are brought to be coincident with one another. And by rotating the suction plate mounting lever 16 by 90° after the suction plate 18 is held by the suction plate holder 17 of the suction plate mounting lever 16, the center of the suction plate 18 is brought to be coincident with the optical center O of the lens L. Next, this suction plate mounting lever 16 is pushed down so that the suction plate 18 of the suction plate mounting lever 16 is attracted by the lens L on the lens platform 13. When the suction plate 18 is attracted by the lens L, the center of the suction plate 18 and the optical center O of the lens L are brought to be coincident with each other.

[Second Embodiment]

Next, a second embodiment is shown in Figs. 11 through 16.

This lens meter 30 confirms whether the selected lens L will become short in basis material with respect to the spectacles frame (Fig. 3) by optically overlapping the image of the lens L and the displayed image of the lens frame F.

Moreover, in this embodiment, the lens diameter input portion 21a shown in Fig. 2 is omitted and a control circuit is employed in the place of the arithmetic control portion 20' of the arithmetic control portion 20.

A body 31 of the lens meter 30 shown in Fig. 11 has a generally C-shaped side configuration. A display portion 32 such as, for example, an LCD (liquid crystal display) is formed on its bottom portion and a circular truncated cone shaped lens mounting table 33 is disposed on its right-hand side wall 31a which is formed one step higher. The lens mounting table 33 contains therein a ring mask 34 (see Fig. 12) having a ring-shaped light transmitting portion 32a, and half mirrors 35 and 36 are disposed on upper parts of the display portion 32 and the lens mounting table 33 respectively. An opening communicating with a cylinder 37 disposed on the outer surface is formed in an upper part of the body 31 which is disposed above the display portion 32.

As is shown in Fig. 12, the lens meter 30 includes a measuring optical system, and first and second observation optical systems forming the first and second observation optical paths.

The measuring optical system includes optical members such as a light source 38, a condenser lens 39, a diaphragm mask 40, a collimator lens

41, the half mirror 36, the ring mask 34, a reflecting mirror 42, a focus lens 43 and a CCD 44. And an illuminating light from the light source 38 projects the lens L mounted on the lens mounting table 33 onto the CCD 44 through the condenser lens 39, the diaphragm mask 40, the collimator lens 41, the half mirror 36, the ring mask 34, the reflecting mirror 42, and the focus lens 43. This projection image, as shown in Fig. 13, becomes a ring-shaped image A in case there is no cylindrical refraction and it becomes a distorted elliptical image B in case there is the cylindrical refraction. And the optical characteristics of the lens L is measured in the arithmetic control portion 20' by this projection image and the result is displayed on the displaying surface 32a of the display portion 32 as shown in Fig. 11.

The first observation optical system includes optical members such as the display portion, the display portion 32, the half mirror 35, a lens 45, a reflecting mirror 46, and an ocular 47. And the display portion 32a is projected to an observing eye E through the first observation optical system comprising the half mirror 35, the lens 45, the reflecting mirror 46, the ocular 47, etc.

The second observation optical system includes optical members such as the half mirror 36, a lens 48, the half mirror 35, the lens 45, the ocular 47. And the lens L mounted on the mounting table 33 containing therein the ring mask 34 is projected to the observing eye E through the second observation optical path comprising the half mirror 36, the lens 48, the half mirror 35, the lens 45, the reflecting mirror 46, the ocular 47, etc. The lens 48 is adapted to make the power of the lens L coincident with the display power of the display portion 32.

In this way, the commonly used lens 45, reflecting mirror 46 and ocular 47 among the first and second observation optical paths constitute a common optical path for simultaneously visually confirming the display on the displaying surface 32a of the display portion 32 and the lens L superposed one upon the other.

Also, as is shown in Fig. 14, the arithmetic control portion 20' calculates the data of the prescription in order to display the frame configuration D1, the frame center D2, the pupil center D3, the astigmatism axis X, etc. on the displaying surface 32a. At this time, as is shown in Fig. 15, the astigmatism axis X having a predetermined angle α is displayed.

And by bringing the cylindrical axis X' direction to be coincident with the astigmatism axis X direction and the optical center O to be coincident with the pupil center D3, respectively, by means of, for example, manually adjusting the lens L while looking at the displaying surface 32a, there can be

confirmed whether the lens L on the displaying surface 32a will become short in basis material.

Also, when the surface of a lens must be taken into consideration as in a case with a multi focus lens (double focus lens of Fig. 16), etc., the lens surface is observed in order to confirm whether the near-use portion L1 is correctly included in the frame configuration D1. Also, by inputting a near-use pupil PD beforehand, the near-use pupil center D4 may be displayed.

It may be designed such that the astigmatism axis X, the frame configuration D1, the frame center D2, the pupil center D3, etc. displayed on the displaying surface 32a by the arithmetic control portion 20 are displayed in a position where the pupil center D3 and the measuring optical axis of the measuring optical system are coincident with each other, or in a position slightly displaced by a predetermined amount according to necessity, and the cylindrical axis X' of the lens L and the optical axis are brought to be coincident with the pupil center D3. With this construction, by providing the jig mounting means as shown in Fig. 1, the attraction of the suction plate can be effected without moving the lens L after confirmation.

In this embodiment, when there is a difference between the refractive power of the data of the prescription input beforehand and the refractive power of the lens L measured, this difference is detected by warning means and a message to that effect is displayed on the displaying surface 32a. Further, a warning is issued by the buzzer 23, etc. of the first embodiment, for example.

As described in the foregoing, the lens meter as claimed in claim 1 comprises means for measuring the optical characteristics of a lens to be processed, means for inputting information of the outer periphery of the lens, means for inputting the information of the configuration of the spectacle frame, and means for composite displaying the optical characteristics, the information of the outer periphery of the lens and the information of the frame configuration. Accordingly, the "YES" or "NO" judgment for processing the lens can be performed with ease and with correctness irrespective of the provision of a lens plate.

Also, the lens meter as claimed in claim 2 comprises means for measuring the optical characteristics of the center of the external configuration of the lens, means for inputting the diameter of the lens, means for inputting information of the configuration of the frame for the spectacles, means for inputting distances between the centers of lens frames of the spectacles, and between the pupils of the person wearing the spectacles, or a difference in distances between the centers of lens frames of the spectacles and between the pupils, arithmetic means for calculating the position

of the optical center from the prism quantity in the center of the external configuration of the lens measured by the measuring means, and means for composite displaying the lens frame of the spectacles and the eye point position of the person wearing the spectacles obtained by the frame configuration information input means and the distance input means and the information of the outer periphery of the lens when the eye point position and the optical center are brought to be coincident with each other on the same screen. Accordingly, this can be well coped with a lens in which the optical center is displaced from the center of the external configuration.

Also, the lens meter as claimed in claim 3 includes means for inputting eye inspection data, and the display means is adapted to composite displaying the astigmatism axis of the eye inspection data on the eye point position. Accordingly, it is no more required to train the user for a long time even when it has the astigmatism.

Also, the lens meter as claimed in claim 4 comprises means for making a "YES" or "NO" judgment for processing the lens in accordance with the lens frame of the spectacles and the eye point position of the person wearing the spectacles and the information of the outer periphery of the lens, and means for displaying the result of the judgment. Accordingly, it is no more required to train the user for a long time.

Also, the lens meter as claimed in claim 5 comprises means for measuring the optical characteristics of the lens, and means for mounting the jig on the lens held on a lens holding portion of the measuring means. Accordingly, the mounting of the processing jig onto the lens can be performed with ease and with correctness.

Also, the lens meter as claimed in claim 6 comprises means for inputting lens data properly treated in accordance with the eye inspection, arithmetic means for comparing the data input by the lens data means with the result of the measurement obtained by means for measuring the optical characteristic of the lens in order to find whether they are coincident with each other, and means for displaying the result of the judgment made by the arithmetic means. Accordingly, the "YES" or "NO" judgment for processing the lens can be known without fail in accordance with the lens processing data.

Also, the lens meter as claimed in claim 7 comprises means for inputting information of the frame configuration of the spectacles, means for inputting the distance between the centers of the lens frames of the spectacles and the distance between the pupils of the person wearing the spectacles, or a difference between the distance between the centers of the lens frames and the

distance between the pupils, means for measuring the optical characteristics of the lens, means for displaying the optical characteristics and information of the frame configuration, a first observation optical path for observing the display surface of the display means, and a second observation optical path for observing the external configuration and the outer surface of the lens, and said first and second observation optical paths include a common optical path for simultaneously visually confirming the display on the display surface and the lens which are placed one upon the other. Accordingly, even when the lens is a multi focus lens, etc. other than a single focus lens, correct positional setting can be effected with ease while taking into consideration the outer surface of the lens.

Also, the lens meter as claimed in claim 8 comprises an input device for inputting the prescription data, and the display surface of the display means is set to display the orientation of the astigmatism axis from the data input by the input device. Accordingly, it is no more required to train the user for a long time even when it has the astigmatism.

Also, the lens meter as claimed in claim 9 comprises means for issuing a warning when there is a difference between the refractive power of the prescription data input and the refractive power of the lens measured. Accordingly, it is no more required to train the user for a long time. At the same time, there can be prevented such a careless mistake as that a lens different from one as prescribed is processed.

Claims

1. A lens meter including means for measuring the optical characteristics of a lens to be processed, means for inputting information of the outer periphery of the lens, means for inputting information of spectacle frame, and means for composite displaying the optical characteristics, the information of the outer periphery of the lens, and the information of the frame configuration.

2. A lens meter including means for measuring the optical characteristics of the center of the external configuration of a lens to be processed, means for inputting the diameter of the lens, means for inputting information of the configuration of a frame for a pair of spectacles, means for inputting distances between the centers of lense frames of the spectacles, and between the pupils of the person wearing the spectacles, or a differences in distances between the centers of lense frames of the spectacles and between the pupils, arithmetic means for calculating the position of the optical center from the prism quantity in the center of the

external configuration of the lens measured by the measuring means, and means for composite displaying the lens frame of the spectacles and the eye point position of the person wearing the spectacles obtained by said frame configuration information input means and said distance input means and the information of the outer periphery of the lens when the eye point position and the optical center are brought to be coincident with each other on the same screen.

3. A lens meter according to claim 2 which further includes means for inputting eye inspection data, and said display means is adapted to composite displaying the astigmatism axis of the eye inspection data on the eye point position.

4. A lens meter including means for making a "YES" or "NO" judgment for processing a lens to be processed in accordance with the lens frame of the spectacles and the eye point position of the person wearing the spectacles and the information of the outer periphery of the lens, and means for displaying the result of said judgment.

5. A lens meter including means for measuring the optical characteristics of a lens to be processed, and means for mounting the jig on the lens held on a lens holding portion of said measuring means.

6. A lens meter including means for inputting lens data properly treated in accordance with the eye inspection, arithmetic means for comparing the data input by said lens data means with the result of the measurement obtained by means for measuring the optical characteristic of the lens in order to find whether they are coincident with each other, and means for displaying the result of the judgment made by the arithmetic means.

7. A lens meter including means for inputting information of the frame configuration of spectacles, means for inputting the distance between the centers of the lens frames of the spectacles and the distance between the pupils of the person wearing the spectacles, or a difference between the distance between the centers of the lens frames and the distance between the pupils, means for measuring the optical characteristics of the lens, means for displaying the optical characteristics and information of the frame configuration, a first observation optical path for observing the display surface of the display means, and a second observation optical path for observing the external configuration and the outer surface of the lens, and said first and second observation optical paths including a common optical path for simultaneously visually confirming the display on the display surface and the lens which are placed one upon the other.

8. A lens meter according to claim 7 which further includes an input device for inputting the

prescription data, and in which the display surface of the display means is set to display the orientation of the astigmatism axis from the data input by the input device.

9. A lens meter according to claim 8 which further includes means for issuing a warning when there is a difference between the refractive power of the prescription data input and the refractive power of the lens measured.

5

10

15

20

25

30

35

40

45

50

55

60

FIG. 1

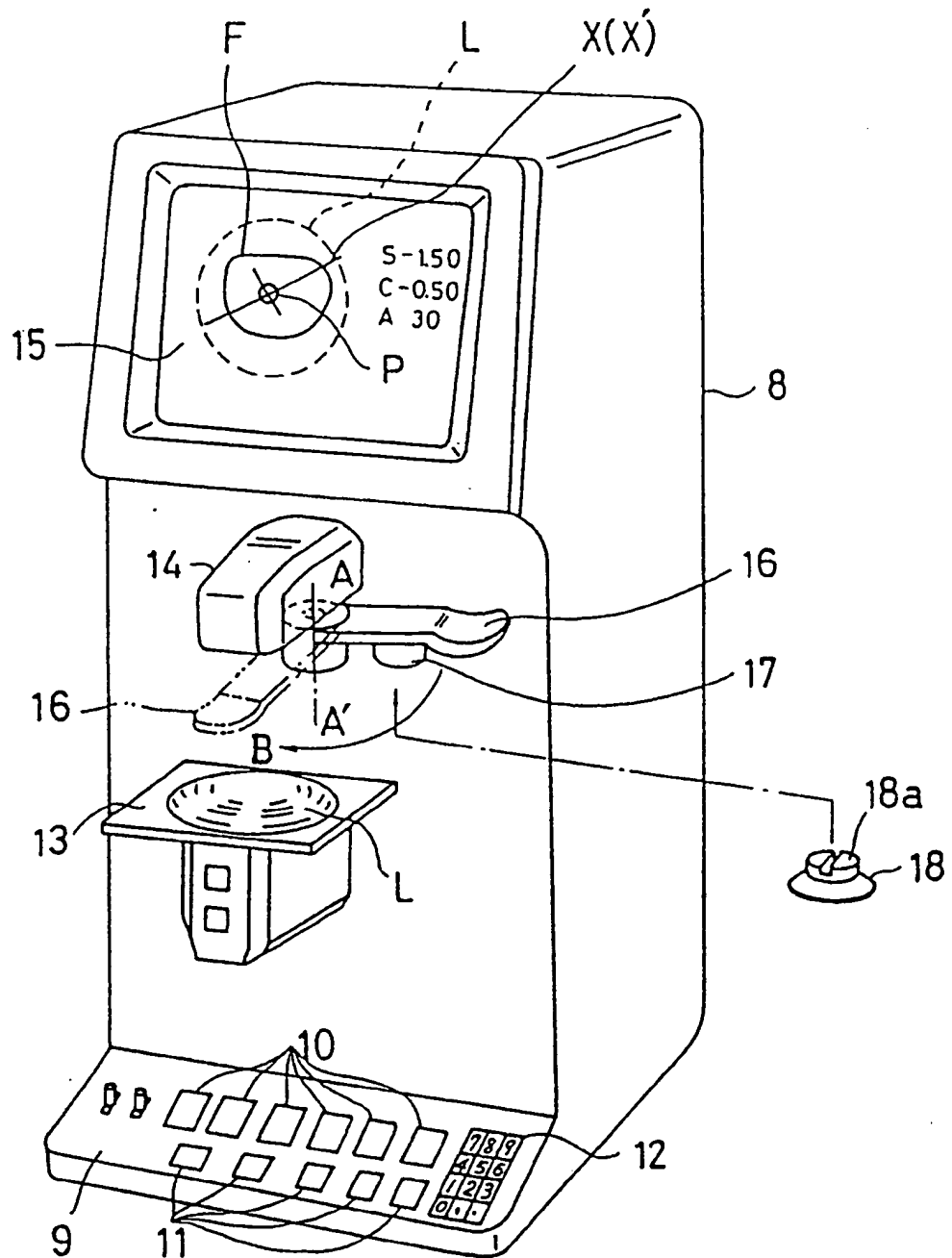


FIG. 2

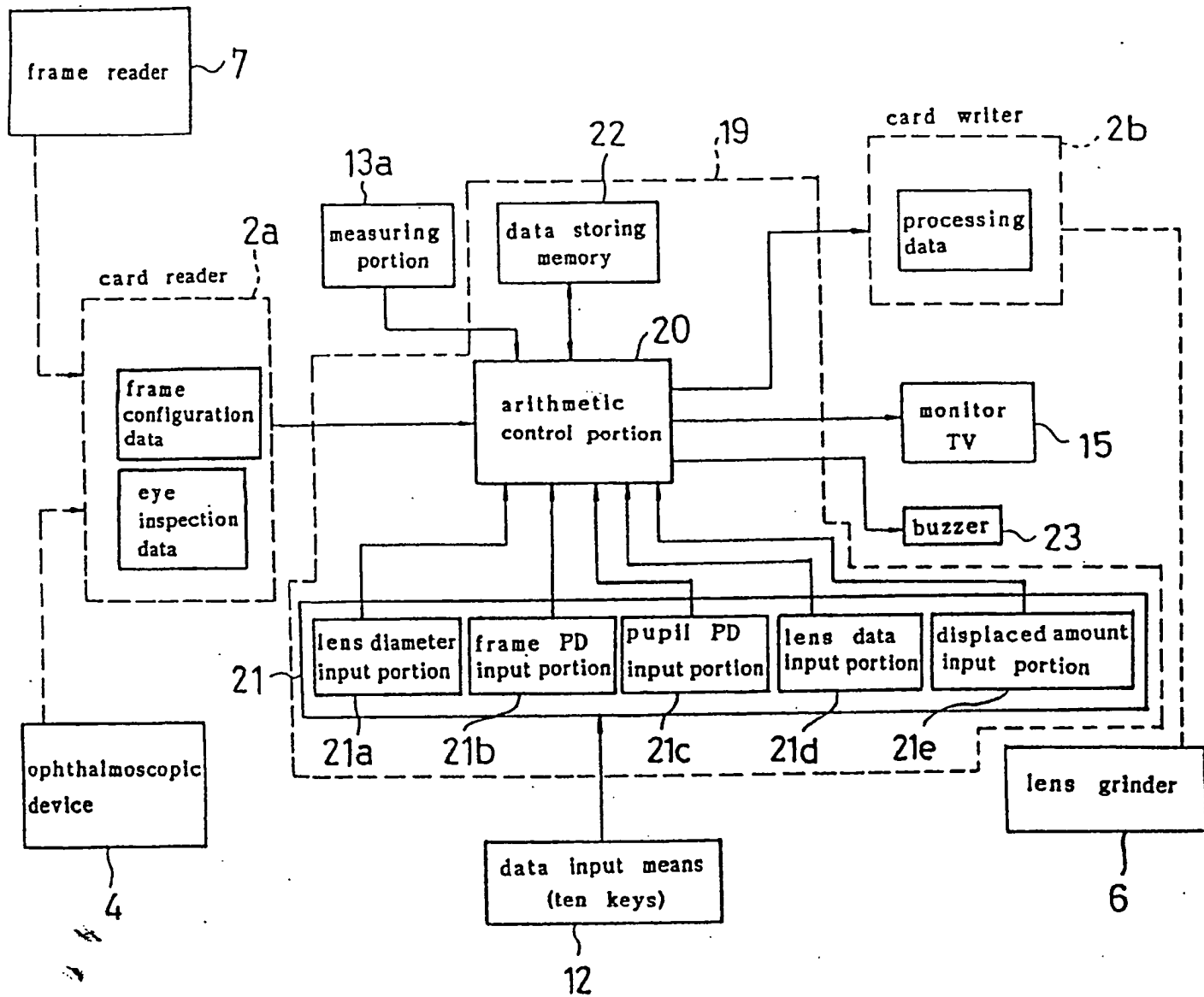


FIG. 3

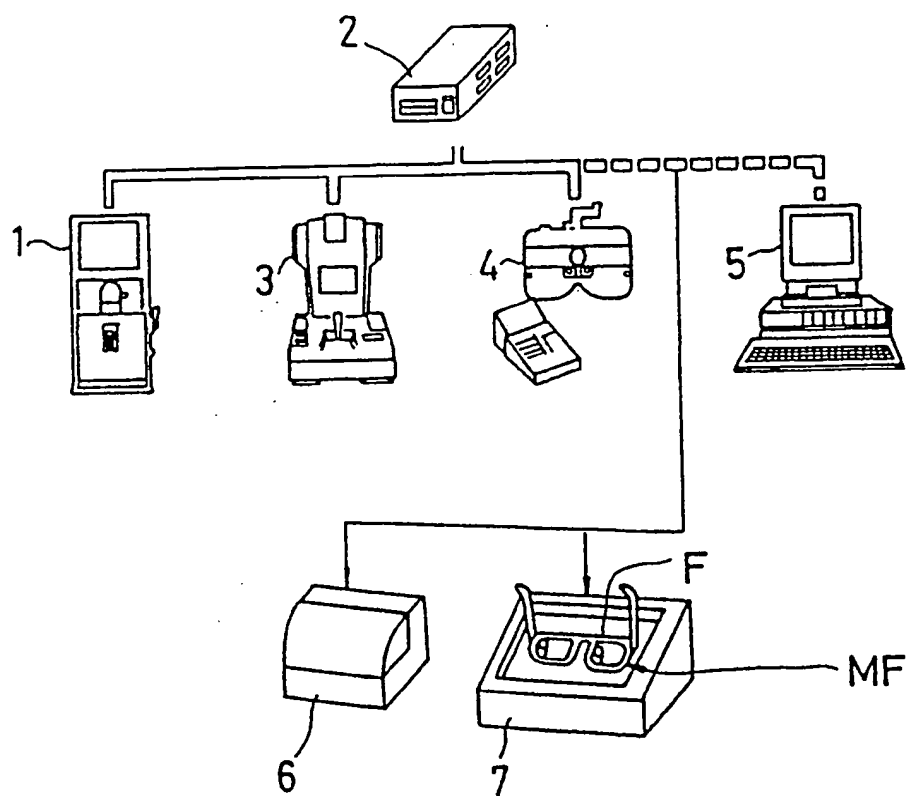


FIG. 4

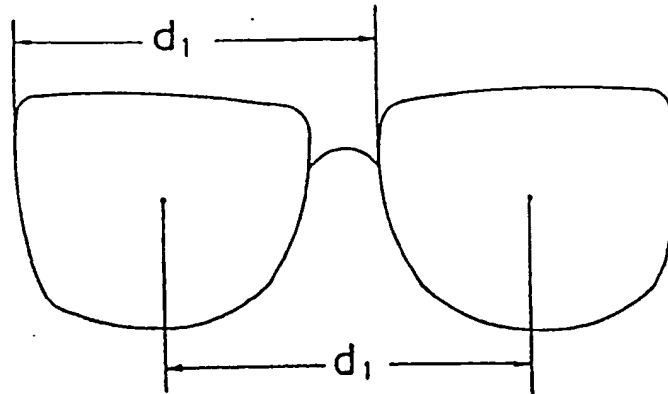


FIG. 5

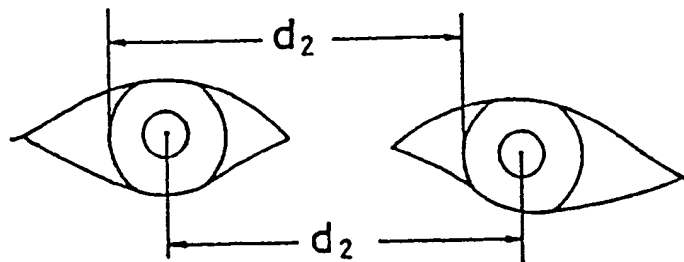


FIG. 6

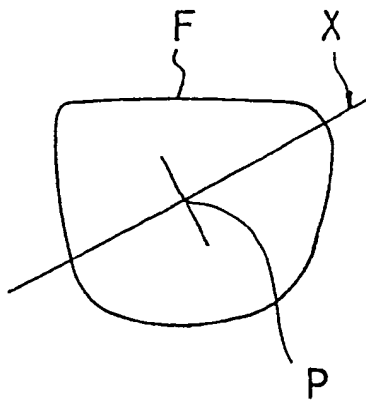


FIG. 7

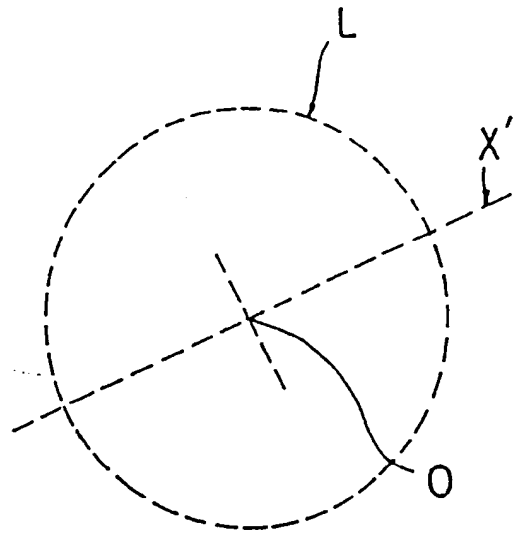


FIG. 8

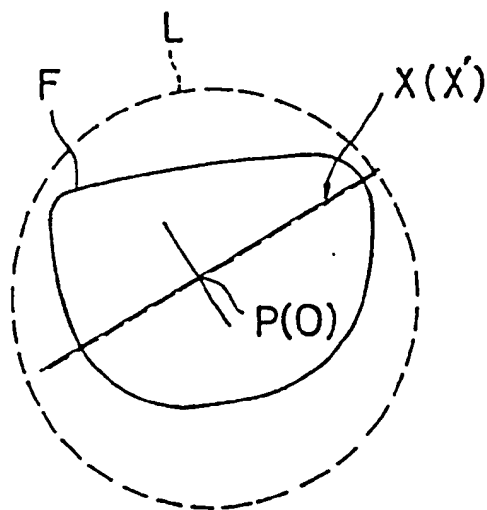


FIG. 9

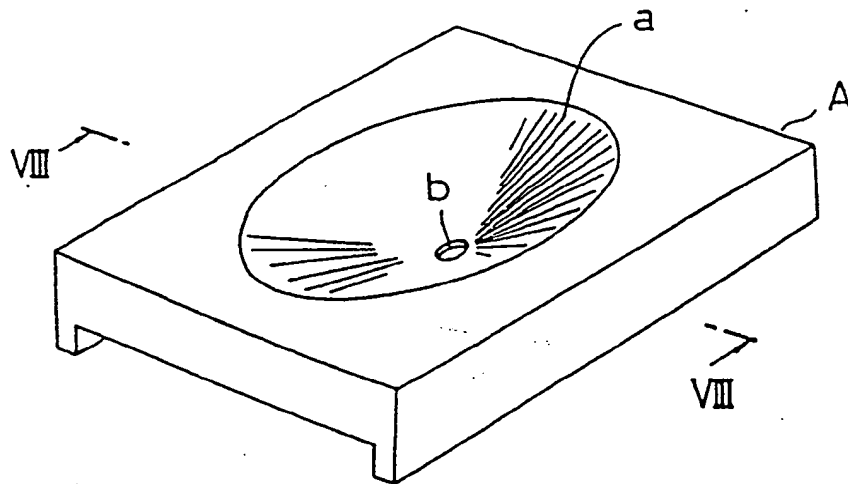


FIG. 10

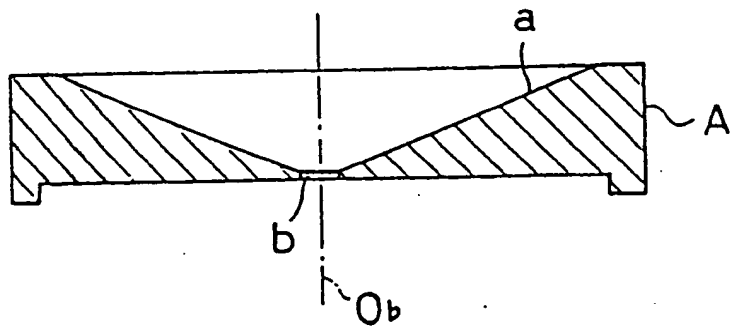


FIG. 11

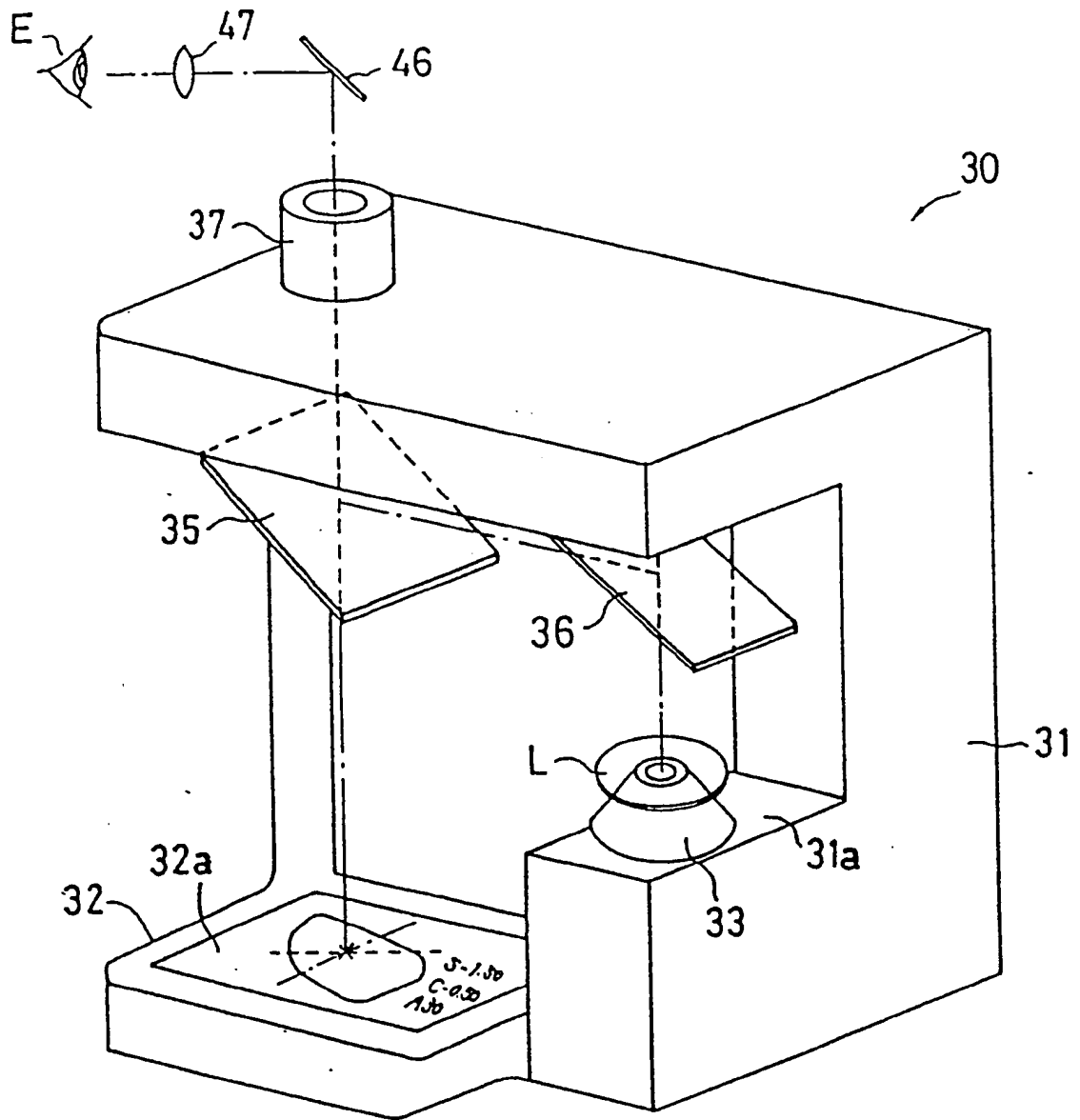


FIG. 12

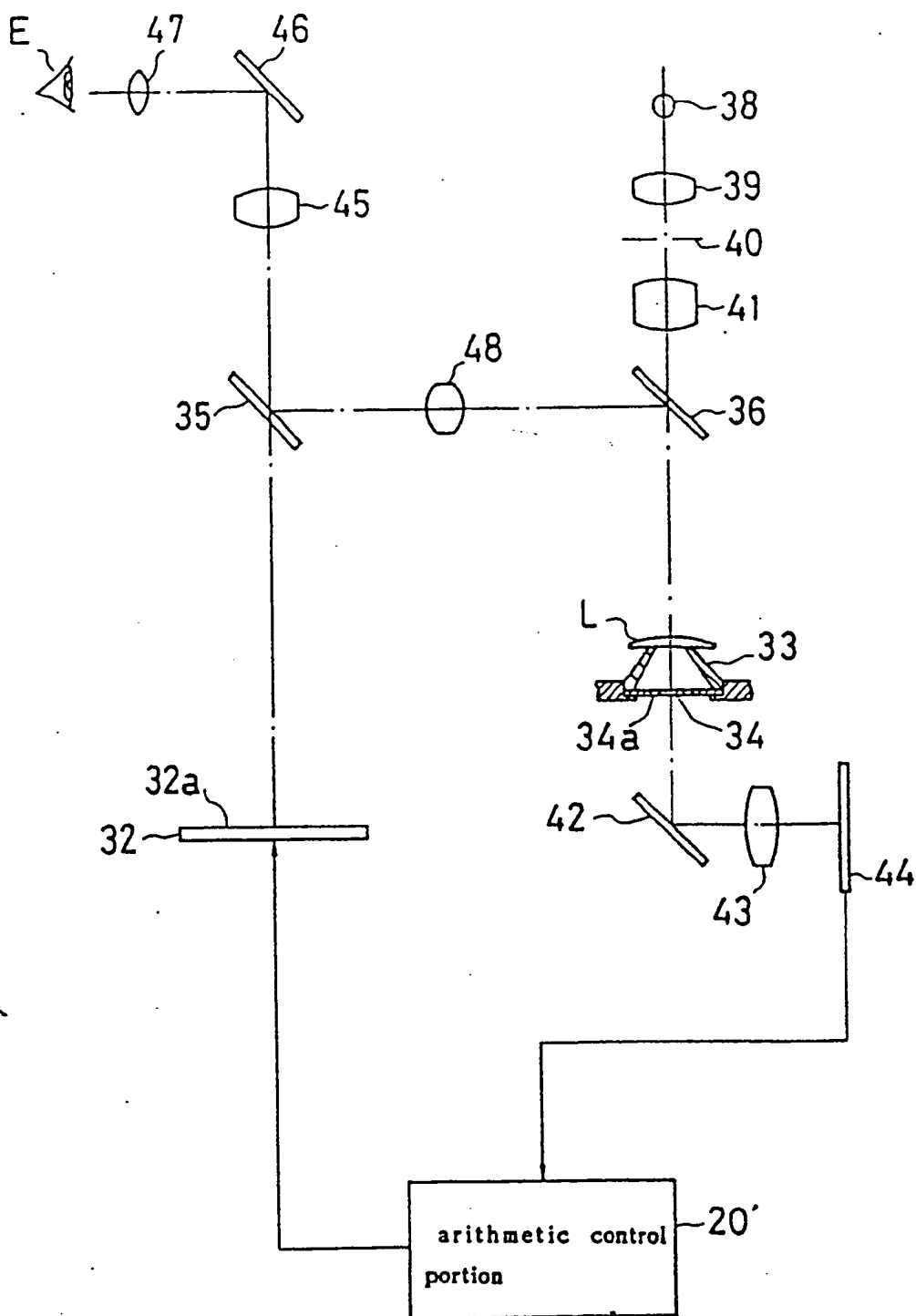


FIG. 13

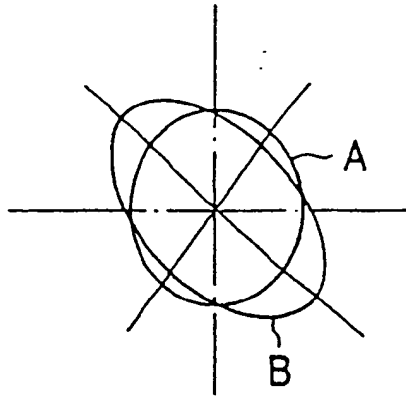


FIG. 14

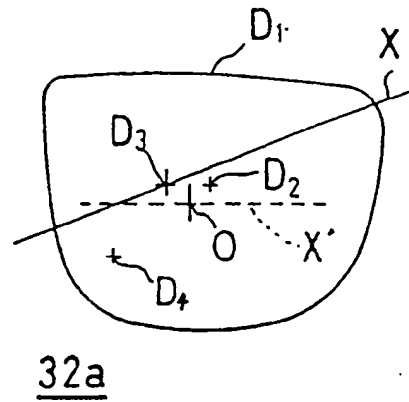


FIG. 15

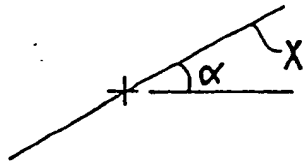
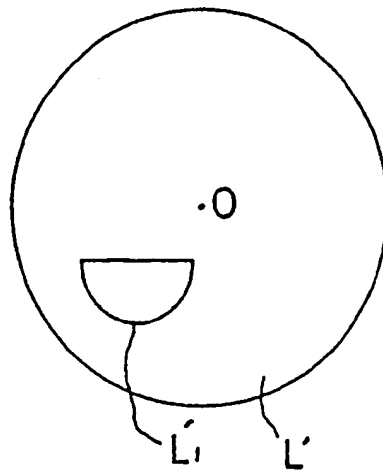


FIG. 16





Europäisches Patentamt
European Patent Office
Office européen des brevets



Publication number:

0 363 281 A3

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 89402742.4

(51) Int. Cl.⁵: G02C 13/00

(22) Date of filing: 04.10.89

(30) Priority: 05.10.88 JP 251436/88
24.01.89 JP 14356/89

75-1, Hasunuma-cho Itabashi-ku
Tokyo(JP)

(43) Date of publication of application:
11.04.90 Bulletin 90/15

(72) Inventor: Ishihara, Taketoshi c/o Kabusiki
Kaisha TOPCON
75-1 Hasunuma-cho Itabashi-ku
Tokyo(JP)

(84) Designated Contracting States:
DE FR GB NL

(88) Date of deferred publication of the search report:
08.05.91 Bulletin 91/19

(74) Representative: Mongrédien, André et al
c/o SOCIETE DE PROTECTION DES
INVENTIONS 25, rue de Ponthieu
F-75008 Paris(FR)

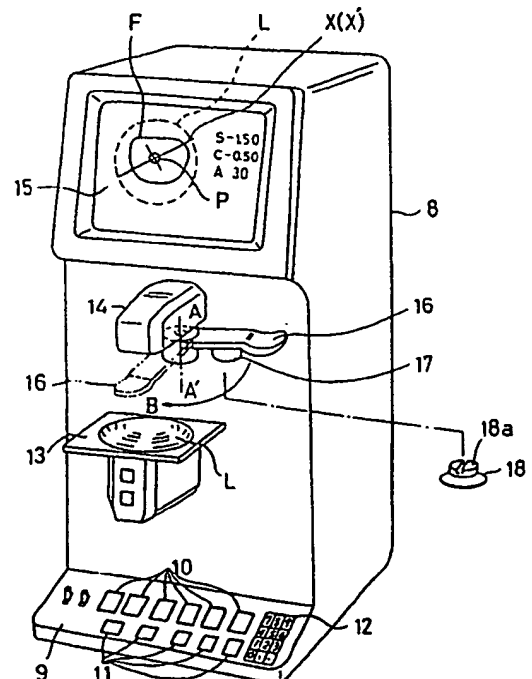
(71) Applicant: Kabushiki Kaisha TOPCON

(54) Lens meter.

(57) A lens meter has means for measuring the optical characteristics of a lens to be processed, means for inputting information of the outer periphery of the lens, means for inputting information of spectacle frame, and means for composite displaying the optical characteristics, the information of the outer periphery of the lens, and the information of the frame configuration.

Therefore, the "YES" or "NO" judgment for processing the lens can be performed with ease and with correctness irrespective of the provision of a lens plate.

FIG. 1





European
Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 40 2742

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-4 730 260 (M. MORI) " Claims; figure 5 "	1,4	G 02 C 13/00
A	EP-A-0 260 710 (HOYA CORP.) " Claims; figure 5 "	1,4	
A	PATENT ABSTRACTS OF JAPAN, vol. 9, no. 133 (P-362)[1856], 8th June 1985; & JP-A-60 15 623 (TOUKIYOU KOUGAKU KIKAI) 26-01-1985	1	
A	EP-A-0 061 918 (HOYA LENS) " Claims "	1	
A	GB-A-2 165 976 (HOYA LENS)		
A	EP-A-0 160 985 (TOYO KOKAGKU KIKAI) " Claims "	1,4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			G 02 C 13/00
The present search report has been drawn up for all claims			
Place of search		Date of completion of search	Examiner
The Hague		15 February 91	CALLEWAERT-HAEZEBROU
CATEGORY OF CITED DOCUMENTS			
X: particularly relevant if taken alone		E: earlier patent document, but published on, or after the filing date	
Y: particularly relevant if combined with another document of the same category		D: document cited in the application	
A: technological background		L: document cited for other reasons	
O: non-written disclosure			
P: intermediate document			
T: theory or principle underlying the invention		&: member of the same patent family, corresponding document	

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☒ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.